

# Transfer of Iodine and Cesium from the Surface of Leaf, Trunk or Fruit to the Interior of Apple Fruit

Hitoshi KAWABATA, Masumi YANAI, Yasuhiro TAKO, Yuichi TAKAKU, Shun'ichi HISAMATSU

*Department of Radioecology*

## Abstract

Part of the radionuclides released into the atmosphere are deposited on the surfaces of crop plants, followed by absorption and translocation to other parts of the plants. Radiocesium released into the atmosphere by the 2011 accident of the Fukushima Dai-ichi Nuclear Power Plant were detected in fruit harvested from trees which did not extend leaves at the time of the atmospheric deposition to these orchards. Apple fruit is one of the important agricultural products in Aomori Prefecture, where the first commercial nuclear fuel reprocessing plant is now under construction. Since the behavior of radiocesium and radioiodine deposited on apple tree surfaces and transfer to fruit is not well known, we started a research project in FY 2016 to study them, mainly by using corresponding stable elements.

The experimental methods were established in FY 2016. Plumleaf crab apple (*Malus sp.* cv. ALPS OTOME) was selected as the experimental plant for easy handling. Dry and wet depositions were simulated by applying dry aerosol and liquid droplets containing a target element, respectively. The nondestructive measurement methods of the surface areas of leaf, bark and fruit were developed for estimating the dry aerosol burden of the target element. Washing methods of the plant part surface, to which the target element was applied, are important for distinguishing retention on the surface from an absorbing fraction. The methods were decided for each plant part based on preliminary experiments. In this study, we defined the element washed by the method as retained on the surface, while the unwashed one was defined as the absorbed fraction.

Uptake of iodine from fruit surface was preliminary studied by applying droplets of an aqueous solution containing NaI on the fruit surface. Apple trees were cultivated under the conditions of 30 and 40 klx in artificial climate chambers. Approximately 50% of iodine was absorbed and retained in fruit on days 4 and 8 after the application, and no difference was found for the absorption rate between the different light conditions. The fraction on the surface was smaller than 1%, and the remainder, half of the applied iodine, may be transferred to other parts of the tree and/or vaporized. The fractions of 40% and 60% of iodine in the fruit were distributed to skin and flesh on day 4 after the application, respectively, showing penetration of a considerable part of the iodine from the surface into the fruit flesh.

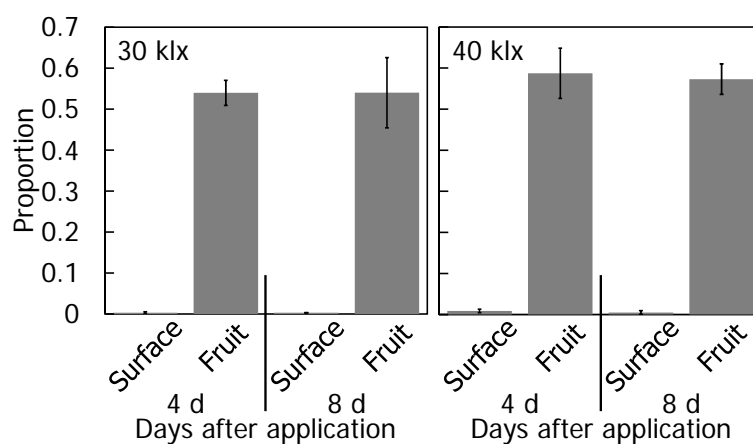


Fig. 1 Proportion of I distributed on surface and in fruit to applied I. Apple trees were cultivated under the condition of 30 or 40 klx during 4 or 8 days after application of I solution to fruit surface. Vertical bars indicate standard deviation of three samples.

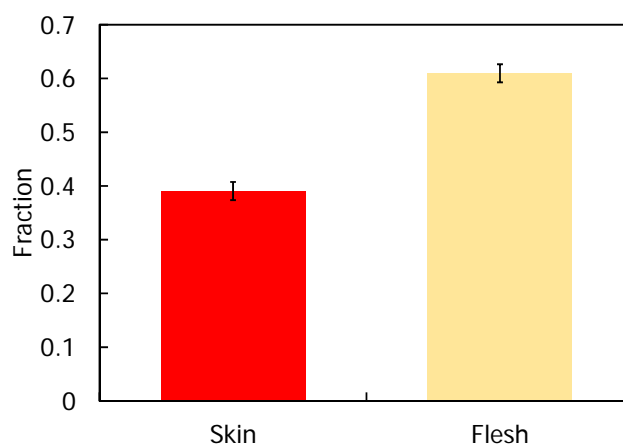


Fig. 2 Fraction of I in the fruit distributed to skin and flesh. Apple trees were cultivated under the condition of 40 klx during 4 days after application of I solution to fruit surface. Vertical bars indicate standard deviation of three samples.